



WHITE PAPER

VPNWorX

New Dimensions for VPNs

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1. Introduction

Lucent Technologies' VPNWorX™ is the industry's most comprehensive solution for virtual private networking. VPNWorX affords the flexibility to configure optimal VPNs with a choice of service platforms, security options, performance levels, management capabilities and business models. Spawned from incorporating the leadership position established by Ascend Communications and nurtured by the technological strengths of Lucent, this robust offering sets a new standard for VPNs.

Lucent created VPNWorX to fulfill the promise of VPNs for enterprise organizations and service providers alike. The end-to-end VPNWorX strategy has four equally important dimensions that together maximize the benefits of virtual private networking:

- The hallmark of VPNWorX is its visionary **provider/subscriber approach**. VPNs that utilize VPNWorX products and VPNWorX-based services afford unparalleled business-class capabilities with superior price/performance.
- Several powerful **application-enabling capabilities** add tremendous depth to VPNWorX. Providers deploy these compatible, highly-differentiated value-added services for the benefit of their enterprise subscribers, who can employ any or all to meet even the most demanding VPN requirements.
- Lucent is evolving its **policy-driven network and service management** into an end-to-end, top-to-bottom solution with emphasis on security, quality of service and resource allocation. The intuitive GUI presents comprehensive rule sets that accommodate application-specific data, voice and video communications needs.
- The provider/subscriber investment in VPNWorX is protected with a built-in migration path to **fully converged voice and data VPNs**. Users can support ordinary voice and fax capability, or add advanced multimedia applications, such as videoconferencing and distance training.

Lucent's NetCare™ Direct-Touch professional services add the equivalent of a fifth dimension to VPNWorX by bringing a wealth of expertise and experience to the deployment of next-generation public network infrastructure by service providers, and to the implementation of VPNs by or for their enterprise subscribers.

Individually, the four dimensions of VPNWorX advance the state of the art for virtual private networking. Collectively, they raise the bar for the industry by making the full potential of VPNs a practical reality today.

Provider/Subscriber Approach

Lucent was the first vendor to adopt a provider/subscriber approach to VPNs. Lucent's end-to-end provider/subscriber approach fully leverages technological advances in the current and next-generation public network infrastructure to maximize the benefits and minimize the risks for both parties. As a result, VPNWorX delivers more capabilities, better performance and far greater flexibility.

For example, a real problem with most private networks is the lines of demarcation between the enterprise and the LEC (local exchange carrier), the LEC and the IXC (inter-exchange carrier), the IXC and a second LEC at the remote end, and finally the second LEC and the remote enterprise site. Owing to the inherent complexity of multiple parties with no one party able to provide overarching control, often the best a network manager can do is hope nothing goes wrong.

Lucent wanted to solve this and other fundamental shortcomings of private networks with a more seamless end-to-end arrangement between service providers and their enterprise subscribers. With VPNWorX, for example, Lucent's Customer Network Management (CNM) Gateway lets the enterprise monitor, configure and otherwise manage its virtually private portion of the public

network infrastructure from the user-friendly Web browser interface, facilitating genuine end-to-end management. Lucent's policy-based tools cover the gamut from basic tunneling and security management to service level monitoring and bandwidth management.

Application-enabling Capabilities

VPNWorX conforms to industry standards, but goes well beyond these "basics" with end-to-end extensions and enhancements that benefit both providers and subscribers. Here are just a few of the application-enabling, value-added capabilities of VPNWorX:

- A choice of fundamental VPN architectures based on three service platforms: Secure Internet, Quality IP and Frame Relay/ATM
- A variety of cost-effective local access options, ranging from conventional PSTN-based dial-up or leased lines to advanced wireless, cable and digital subscriber line (DSL) technologies
- Mission-critical performance through Quality of Service (QoS) and Service Level Agreement (SLA) assurances
- Policy-based VPN management to simplify provisioning and monitoring, security administration, and bandwidth management
- End-to-end service and network management, including Customer Network Management of the VPN
- Support for value-added applications ranging from e-commerce and Web hosting to multimedia streaming and Web caching
- Intelligent Networking (IN) to facilitate convergence and add cost-saving efficiencies, such as Internet Call Diversion, which redirects Internet data traffic away from the PSTN to preserve its capacity for circuit-switched voice.

Lucent is committed to maintaining its leadership position in VPN technology with future enhancements that advance the state of the art while maintaining backwards compatibility and protecting the investment in VPNWorX solutions.

Policy-driven Network and Service Management

Lucent is evolving its management systems to provide policy-based control of networks and services end to end and top to bottom across both provider and subscriber domains. Three key areas are the focus of Lucent's policy-based management initiative: security, quality of service and resource allocation.

Policies are essentially high-level sets of rules that direct network behavior to match business needs, priorities and processes. The rules are translated into detailed configurations, which are then applied through the allocation of available network capabilities and resources.

An intuitive graphical user interface (GUI) lets network managers enter and edit easy-to-understand, high-level rules, which substantially simplifies VPN management. Traffic-smart networking enables managers to deploy united and harmonized policies that provide end-to-end network traffic predictability and control. The comprehensive rule sets accommodate application-specific data, voice and video communications needs.

Fully Converged Voice and Data VPNs

Just as VPNs are inevitable for enterprise networking, so too is public network convergence that integrates voice, video, fax and data communications. Lucent achieves convergence by marrying the next-generation public network, consisting of the Internet, carrier IP, Frame Relay and ATM, to the PSTN. The result is a more flexible and affordable *universal* communications infrastructure.

Lucent's value-added IN capabilities, for example, allow the mix of voice, video, fax and data traffic to traverse the combined public network as a seamless mix of circuits, packets, frames and cells on a session-by-session basis that matches application requirements with available infrastructure resources.

The seamless marriage and IN capabilities also enable new and powerful productivity-enhancing applications, such as collaborative work. Lucent even supports multimedia "broadcasts" with full multipoint capabilities in the core. Best of all, because these capabilities are already built in to VPNWorX products, users can take advantage of convergence at any time—with full investment protection.

VPNWorX Flexibility

The comprehensive nature of VPNWorX affords unprecedented flexibility for the service providers that offer—and the enterprise organizations that utilize—its industry-leading breadth and depth. With VPNWorX end to end, providers and subscribers get complete freedom of choice with respect to:

- VPN architectures based on the Internet, carrier IP, frame relay and ATM
- Comprehensive and integrated security provisions, including integrated firewalls, IPSec, closed user groups and logical segmentation of physical resources
- Tiered Quality of Service (QoS) options ranging from "best effort" to an "absolute" assurance of both throughput and latency
- Service Level Agreement (SLA) delivery and confirmation reporting
- End-to-end management with genuine Customer Network Management
- Value-added features, such as Voice over IP (VoIP) and IP multicast
- Value-added consulting services, including systems integration and on-going support
- Division of responsibilities for the design, installation and management of the VPN

The versatility of "virtual" facilitates a whole new way of designing networks. Private networks are normally planned as incremental changes to the existing design. With VPNWorX, by contrast, network planners avoid the problems and waste associated with such "incremental thinking" by taking full advantage of the "all-in-one" VPN for private intranet, semi-private extranet and public Internet access. VPNWorX allows the planning process to leverage new, more advanced services in the public network, which lets the enterprise outsource or out-task specific responsibilities to achieve economies of scale, or to supplement internal skills and resources. The net result is to make planning a VPN a relatively straightforward, *business-oriented* process of adding users and applications.

2. VPNWorX End-to-End

The diagram depicts the architectural elements that give VPNWorX its industry-leading capabilities and flexibility. The more notable aspects are highlighted below.

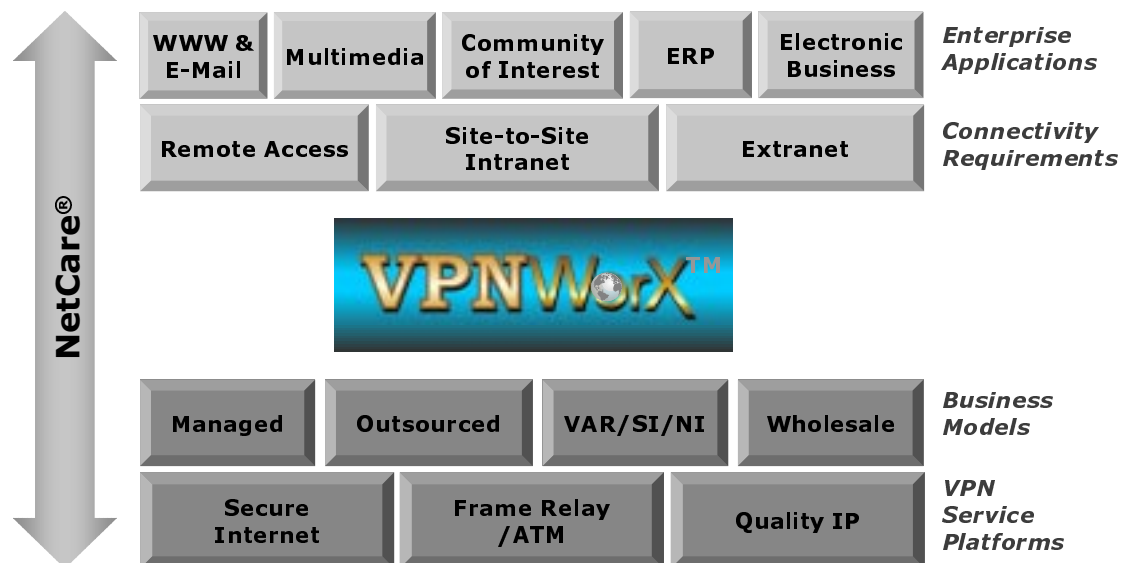


Figure 1 – Lucent's VPNWorX is the industry's most comprehensive VPN solution with both the breadth and depth necessary to maximize the many benefits—at minimal risk.

Service Platforms

The choice of fundamental VPN architectures—based on three VPNWorX service platforms: Secure Internet, Quality IP, and frame relay and ATM—lets network planners configure optimal VPN designs. The capability and flexibility afforded by a choice of three service platforms enables—for the first time—deployment of large-scale, enterprise-wide VPNs. And all three VPNWorX service platforms can be employed individually or in combination in any VPN, as well as in a hybrid private/virtual private enterprise-wide network.

Secure Internet combines multiprotocol tunneling with firewall and IPSec security provisions to make the ubiquitous Internet suitable for remote access, site-to-site intranet and extranet VPNs. As an active participant in the Internet Engineering Task Force (IETF), Lucent's implementation of VPNWorX supports all five leading tunneling technologies to achieve multivendor interoperability in a broad range of applications:

- IPSec's secure and flexible Transport (client/server) and Gateway (router-to-router) modes of tunneling
- Layer 2 Tunneling Protocol (L2TP), an industry standard based on PPTP and L2F, with support for both Gateway and Tunnel modes of operation
- Point-to-Point Tunneling Protocol (PPTP), created in a strategic partnership between Ascend and Microsoft, and now supported by both the Windows NT and NetWare network operating systems
- Layer 2 Forwarding (L2F), an earlier de facto standard still in common use

- Ascend Tunnel Management Protocol (ATMP), an enhanced implementation of standard Generic Routing Encapsulation (GRE)

In addition to a robust implementation of multiprotocol tunneling, VPNWorX offers support for the Internet Key Exchange (IKE), the Public Key Infrastructure (PKI) and Certificate Authorities, Differentiated Services (DiffServ) for QoS-aware routing, policy-enabled VPN deployment and operation, multicast, and SS7 interworking.

Tunneling, especially when combined with strong encryption, can cause performance problems that hinder productivity or impede network expansion. VPNWorX offers a full suite of products to meet the wide-ranging performance needs of both individual users and multiuser sites. And VPNWorX scales to wirespeed throughput, with 3DES (Triple Data Encryption Standard) encryption, and up to thousands of tunnels—per system.

Quality IP adds QoS and SLA performance assurances to IP. VPNWorX lets ISPs and carriers offer these application-enabling guarantees on their own IP network infrastructures, which can continue to interface to the Internet for seamless operation with Secure Internet-based VPNs. Quality IP, particularly when combined with multiprotocol tunneling, is an excellent choice for individual power users and multi-user branch offices within a provider's service area.

VPNWorX lets service providers deliver QoS and SLA guarantees with confidence by supporting a robust assortment of performance standards, including the emerging Multi-Protocol Label Switching (MPLS), Differentiated Services (DiffServ) and Class-Based Queing (CBQ). MPLS serves as the foundation of Lucent's IP performance strategy; the protocol is implemented in all IP switches and each frame relay/ATM multiservice switch. In addition, Lucent's industry-leading, latency-bounding quality of service (QoS) capabilities deliver "toll quality" VoIP and accommodates delay-sensitive applications that require deterministic networks end to end.

Quality IP-based VPNs can be created using "virtual routers" at the edges of the network. Each virtual router is configured and managed like a physical router, with a separate and secure route table and closed user group, allowing the VPN to integrate easily with existing systems and procedures. Another advantage of virtual routing is its ability to utilize private (unregistered) IP addresses, which are the norm in large organizations. Finally, with support for the Virtual Router Redundancy Protocol (VRRP) and the ability to dedicate physical network elements, such as WAN interfaces and bandwidth for QoS and SLA assurances, to a particular VPN, Quality IP is ideal for organizations with delay-sensitive or mission-critical applications.

Frame Relay and ATM deliver the protocol-independent performance and reliability of a leased line—the lifeblood of today's private networks. These Layer 2 VPNs make the powerful capabilities of Lucent's core frame relay and ATM multiservice switches available directly to the enterprise VPN, and are therefore ideal choices for the largest sites. Each accommodates virtually any application—complete with QoS, SLA, management and convergence enhancements.

Lucent's Layer 2 VPNs go beyond traditional permanent and switched virtual circuits to optimize infrastructure utilization in a way that delivers QoS and SLA performance assurances more affordably. The approach permits use of the full spectrum of underlying frame relay and ATM traffic profiles, with their respective price/performance attributes, for tuning VPN configurations to meet the most demanding enterprise requirements.

VPNWorX Benefits for Service Providers

There are three key benefits cited by providers of VPN services, and all three are maximized with a VPNWorX infrastructure solution:

- **Create revenue-generating, value-added services** on the industry's most capable and scalable multiservice platforms.
- **Differentiate service offerings from the competition** by delivering next-generation capabilities today, such as QoS/SLA-aware routing/switching and Intelligent Networking.
- **Contain operating costs** by leveraging the existing infrastructure with a solution that offers carrier-class service and network management, and profitable billing options.

Business Models

All three VPNWorX Service Platforms support a variety of business models to satisfy the full spectrum of provider and subscriber needs—efficiently and effectively.

Many enterprise organizations today wish to take on most of the responsibility for their VPNs, and will therefore prefer a managed service. A **managed service**, at least with VPNWorX, is much more than mere IP bandwidth and a help desk, however, because enterprise subscribers can get end-to-end QoS and SLA performance assurances, along with full provisioning, accounting and policy-based management capabilities.

A growing percentage of enterprise subscribers prefer to **outsource** or out-task as much of the VPN as possible. By diverting precious resources away from routine network operations, outsourcing enables the enterprise to focus on core competencies and other competitive business pursuits. Here is where Lucent's **VAR/integrator** partners can add valuable assistance. The integrator might even combine both the VPN systems and services—as a complete turnkey solution—then take on some or all of the ongoing support responsibilities.

Wholesale arrangements, where ports or other network resources are leased from one provider to another, help expand presence or add capacity. In effect, wholesaling is a VPN among service providers. A good example of wholesaling is the virtual POP or V-POP where a specified number of ports are leased. A service provider is either the lessee, obtaining these resources, or the lessor, leasing them as a revenue-generating part of its business. Either way, wholesaling is a win/win arrangement.

In the ever-evolving landscape of networking, having a choice of flexible business models helps assure both the short- and long-term success of VPN implementations.

Enterprise VPN Applications

The Service Platform and Business Model foundation lets VPNWorX support the three most popular VPN applications today: remote access by individual users, site-to-site intranets among offices, and multi-party extranets with buyers and suppliers. And the many application-enabling features of VPNWorX empower enterprise organizations to implement the new “hot” applications, such as multimedia and enterprise resource planning (ERP), as well as many others.

Remote access VPNs employ multiprotocol tunneling via the Secure Internet Service Platform to minimize the expenses associated with troublesome modem banks, private network management headaches and long-distance dial-up charges. Cost savings can be expected in the range of 50-80 percent, which explains why remote access is the most common use of VPNs today. Indeed, for users already on the Internet (with unlimited access), the remote portion of remote access is effectively free! VPNWorX offers a full suite of solutions for individual users with modems, full- and part-time telecommuters, and SOHO (Small Office/Home Office) environments with higher speed connections—along with a choice of options for the central site(s).

Site-to-site intranets, also referred to as Remote Office/Branch Office (ROBO) internetworking, can employ all three service platforms—Secure Internet, Quality IP and Frame Relay/ATM—on a site-by-site basis depending on the needs of each office. Cost savings can be expected in the 30-50 percent range. Multinational organizations with offices around the world stand to benefit most from site-to-site intranet VPNs. VPNWorX offers a choice of gateways and integrated VPN access routers to accommodate the myriad of office types in an enterprise-wide intranet.

Extranet VPNs with buyers and suppliers are a natural fit for Secure Internet. Indeed, implementing a “private extranet” makes absolutely no sense with such a pervasive and interoperable infrastructure as the Internet. IPSec and other emerging security mechanisms, such as the Public Key Infrastructure (PKI), permit extranets to be as open or as restricted as necessary to meet the demands of these multi-party networks. Quality IP or frame relay might be used for key suppliers and consultants. VPNWorX offers a total solution for extranets of any scope and reach, and interoperates with other industry-standard systems in a multi-vendor environment.

VPNWorX Benefits for the Enterprise

There are four main benefits cited by users of existing VPNs, and enterprises can maximize all four by implementing a VPNWorX solution:

- **Reduce Costs** with an optimal VPN design that affords a single connection for private intranet, semi-private extranet and public Internet access.
- **Extend Reach** to connect individual users and multi-user offices worldwide with support for all popular applications and protocols.
- **Improve Reliability** by managing end-to-end and not just edge-to-edge to accommodate the most demanding applications with full QoS and SLA performance assurances. With VPNWorX, gone are the days of expensive over-subscription and complex mesh topologies to achieve mission-critical dependability.
- **Increase Flexibility** with a choice of VPN architectures, product options, service levels, business models and professional services.

NetCare Professional Services

Lucent’s NetCare Direct-Touch services add exceptional value to VPNWorX with a worldwide staff of trained professionals who can provide indispensable assistance at any stage in a VPN project—from the initial design through its implementation and on-going support. No other company has the breadth or the depth of Lucent’s NetCare:

- Coverage in 44 countries worldwide
- 5 Service/Reliability Centers
- 5 Customer Service Centers
- 6 Secondary Education Centers
- Support in 140 languages
- Over 2000 professionals

NetCare services are available to providers, subscribers and integrators alike to assure the successful implementation and operation of the VPN—end to end and top to bottom.

VPNWorX Solution Examples

The service platforms and business models can be combined to meet specific VPN requirements. For example, a service provider might want to offer an outsourced service based on the Secure Internet platform. Enterprise subscribers would lease Customer Located Equipment (CLE) that performs all tunneling and encryption, and the entire VPN would be managed by the service provider. Or a VAR or network integrator might be involved with the CLE/CPE. The combination of managed services and Quality IP would allow a provider to offer turn-key "business class" VPN services. A solution could even target a specific application, such as managed services for Secure Internet-based remote access VPNs.

3. Lucent's VPNWorX Product Line

Lucent is making enterprise-wide VPNs a worldwide reality today with next-generation platforms and technologies that are transforming the public network into a cost-saving resource for enterprises and a revenue-generating opportunity for service providers.

Lucent's VPNWorX strategy takes a practical approach with incremental and enabling enhancements to the existing public network infrastructure, much of which already employs Lucent's access, routing and switching products. These enhancements also satisfy the myriad needs of enterprise subscribers, enabling them to tap the full potential of the next-generation public network's power and presence.

Lucent's fully integrated VPNWorX offering encompasses products specially designed for service providers and enterprise subscribers. And rather than sell just one or a few VPN "point" products, Lucent has incorporated robust VPN capabilities into its entire end-to-end product line, which also offers a full array of convergence-enabling features. Each access product affords a total VPN solution that integrates a stateful dynamic firewall, a choice of tunneling protocols, IPSec or other security provisions, remote management, and more. All core routing and switching systems also afford a total VPN solution with support for QoS/SLA-enabling protocols, virtual routing, IP/frame/ATM interworking, comprehensive service and network management, and more.

This section presents a list of the provider and subscriber offerings with only a brief description of VPN-related features. Details on these and other products are available at Lucent's Web site (www.lucent.com).

Service Provider Product Line

The comprehensive VPNWorX product line for service providers has three elements: edge-enabled VPN access systems; core routing and switching; and network and service management applications.

Edge-enabled VPN access systems include both gateways and access concentrators. Each supports a wide assortment of access options, and sports a complete set of VPN-specific features, such as tunneling and security provisions. Specific products include:

- Industry-leading MAX, DSL TNT & PortMaster Remote Access Concentrators
- VPN Gateway with the Lucent Managed Firewall (LMF)
- Access Point QVPN routers
- AX series of ATM Access Concentrators

Core routing and switching products add virtual IP routing and/or protocol-independent Layer 2 switching to handle a full range of traffic with maximum effectiveness and efficiency. Lucent's core line-up includes:

- **IP Navigator** (adds MPLS support in Lucent's Multiservice Switches)
- **PacketStar IP Switch** (MPLS-based Quality IP switch/router)
- NX64000 Multi-Terabit Switch/Router (scales to 6.4 Tbps per chassis)
- B-STDX, CBX 500 & GX 550 Multiservice Switches (frame relay and ATM)

The end-to-end VPN is managed with Lucent's network and service management applications:

- **One Vision & Navis** management suites that work with popular management platforms, such as HP's OpenView and IBM's NetView
- **Customer Network Management (CNM) Gateway** giving browser-based access to specific VPN resources
- **Security Management Server (SMS)** for centralized security and policy management
- **SLA Reporting Package** to help service providers deliver and enterprises monitor Service Level Agreements
- **PortAuthority RADIUS** with over 100 enhancements to the industry standard Remote Access Dial-In User Service database

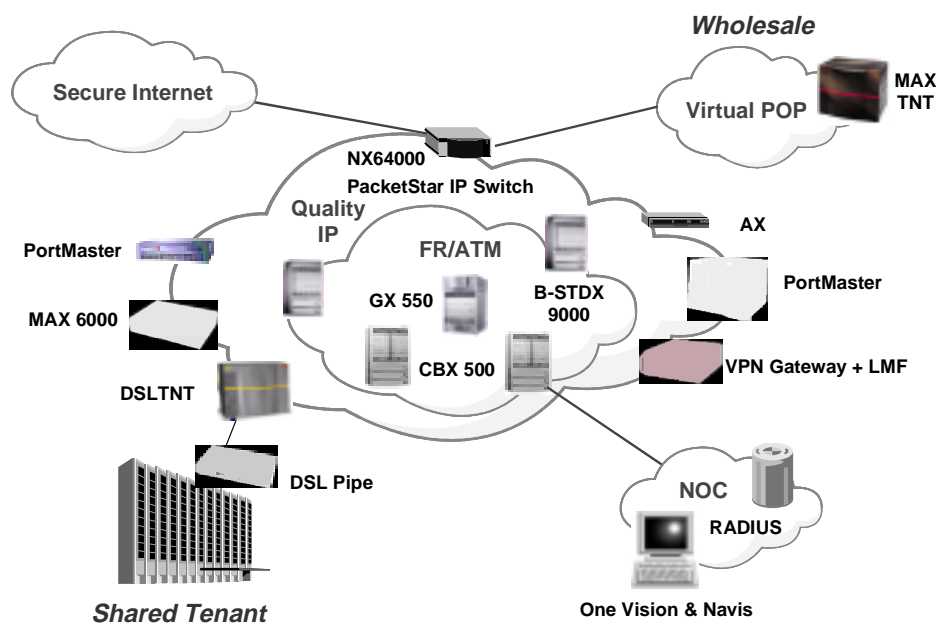


Figure 2 – The VPNWorX-powered Public Network. From the edge through the core of the public network, Lucent offers the industry's most advanced and complete VPN infrastructure solution.

Enterprise Subscriber Offering

The VPNWorX enterprise product line satisfies the needs of enterprise-wide VPNs at three levels: individual users, SOHO/ROBO environments and all major sites.

Individual users, such as mobile workers and others with ordinary modems, can install Lucent's **IPSec Client** software that combines tunneling, IPSec, automatic key exchange, digital certificates and firewall protection in an affordable, easy-to-use solution.

Small Office/Home Office (SOHO) and Remote Office/Branch Office (ROBO) environments—from the single telecommuter to the multi-user facility—can take advantage of the performance-enhancing capabilities of Lucent's award-winning line of **Pipeline & SuperPipe WAN routers**. VPNs benefit substantially from the superb price/performance and low cost of ownership of the Pipeline and SuperPipe offering where every model is a complete VPN-capable router, and some models offer integral voice and fax communications. **Access Point QVPN Routers** and the policy-based **QVPN Builder** add class-based QoS, hardware-accelerated performance and simplified management to any VPN.

For the headquarters and other major sites, Lucent has a number of options including the LAN based appliance versions of the **QVPN routers**, the feature-rich **VPN Gateway/LMF** appliance and management system, or the VPN-capable **MAX & PortMaster** access concentrator products. **Access Point QVPN Routers**. The access concentrators, with both direct dial-in and VPN capabilities, afford an excellent solution for hybrid private/virtual private networks, or for backup of a remote access VPN. All choices offer the capability, scalability and flexibility enterprises need in the migration from private to virtual private networks.

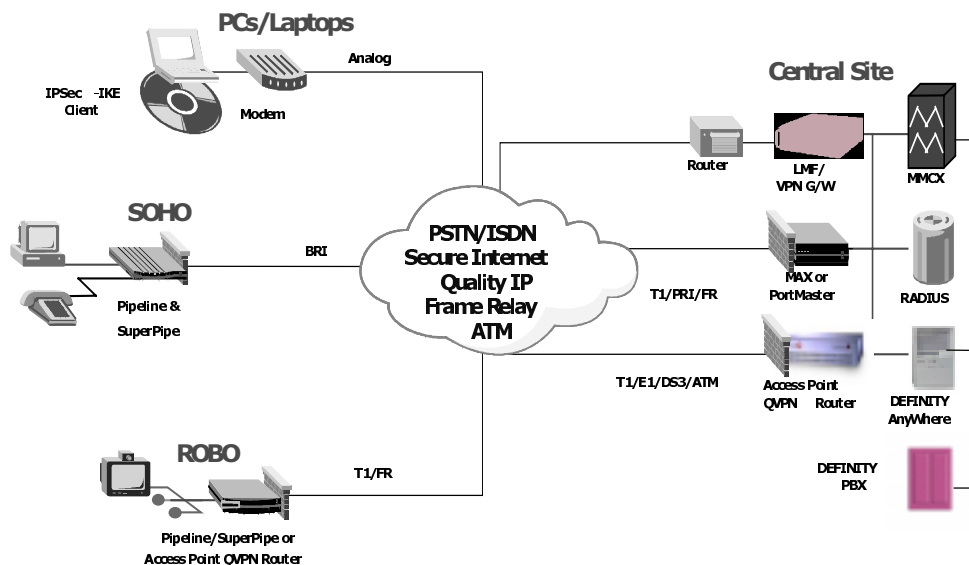


Figure 3 – Enterprise-wide VPNWorX. From the laptop modem user to the headquarters campus, Lucent has a solution that fits every need—and budget.

VPNWorX Features

Lucent's VPNWorX provider/subscriber offering shares these common features:

- IP Security or IPSec with support for...
- Encapsulating Security Payload (ESP) encryption – DES (56-bit Data Encryption Standard) and strong 3DES (168-bit Triple DES)
- Authentication Header (AH) – MD5 and SHA1
- Internet Key Exchange (IKE) and Public Key Infrastructure (PKI) incorporating Certificate Authorities (CAs)
- Integral ICSA-certified dynamic firewalls with stateful inspection
- Choice of multiprotocol tunneling: IPSec, L2TP, PPTP and ATMP/GRE
- Hardware-acceleration of packet encryption (IPSec/IKE/PKI) for line-rate performance (VPN Gateway, SuperPipes, PortMaster 3 and some models of the MAX)
- Choice of local access options: ISDN, FT1/E1, cable, wireless, frame relay, ATM or DSL (IDSL, SDSL and ADSL CAP/DMT)
- Support for MPLS and IP Multicast in edge/core IP routing and switching systems
- Support for Class Based Queuing (CBQ) QoS with ToS byte and Diff-serve support for premises and edge IP routing systems
- Convergence-enabling technologies, such as H.323/320 VoIP and voice over DSL
- Policy-driven deployment and operation of VPNs

Convergence-enabling Products

Lucent offers a rich assortment of technologies that permit the packet-, frame- and cell-based next-generation public network to operate seamlessly with circuit-switched PSTN. For the delay-sensitive nature of voice and video communications, the QoS and SLA performance assurances of Lucent's Quality IP, frame relay and ATM service platforms are vitally important. Some of these technologies are integrated with Lucent's VPN-capable provider and subscriber products; others are available separately:

- **VoIP Gateway** to interface packet/frame/cell-based networks with the SS7-based circuit-switched PSTN
- **Softswitch** that combines support for a variety of signaling protocols
- **Multimedia Communications eXchange** (MMCX) that enables multimedia collaborative work applications, such as videoconferencing for both LAN-based and remote workers
- **Virtual Telephone** for mobile workers and telecommuters, which employs the MMCX platform to combine voice and data communications on a single line
- **DEFINITY® AnyWhere** that adds advanced personal call management features to integrated voice/data collaboration
- **DEFINITY Extender** family that provides a virtual office in a box combining full PBX features with high-speed data communications

VPNs constructed with VPNWorX solutions can integrate voice, video, fax and data communications—now or at any point in the future—to achieve two significant benefits:

- Lower communications costs by taking advantage of the greater bandwidth efficiencies inherent in packet-, frame- and cell-based networks
- Support new productivity-enhancing applications, such as collaborative work and distance learning, by utilizing the any-to-any and any-to-many multicast capabilities of the next-generation public network

4. VPNWorX: Fulfilling the Promise

The VPNWorX Difference

Lucent has established early and strong leadership in the burgeoning VPN marketplace. The pioneers of enterprise-wide VPNs are demonstrating a strong preference for Lucent solutions in the public network infrastructure as well as in the enterprise. Lucent's VPN leadership derives from the company's many strengths and achievements listed here. No other vendor has both the depth and breadth of experience in public network solutions for mission-critical enterprise-wide networking.

- # 1 market position in the PSTN, access concentrators, remote access servers, frame relay, ATM, multimedia and voice CPE
- Top three spots in VPNs (first, second or third) in numerous industry analyst studies
- Most comprehensive family of field-proven VPN products with industry-leading features and international certification for worldwide interoperability
- Highest degree of integration, including built-in firewall and IPSec protections, to simplify VPN installation, operation and management
- Greatest flexibility with a choice of VPN architectures, equipment configurations, security provisions, performance guarantees and management techniques
- QoS and SLA performance assurances that enable service providers to guarantee all three dimensions of availability: throughput, latency and uptime
- Genuine Customer Network Management (CNM) that lets service providers and their enterprise subscribers jointly, completely and securely manage the end-to-end VPN
- Delivery of "converged" VPNs that integrate voice, fax, video and data communications, including the any-to-many capability of IP multicast

Lucent has set a new standard for the industry by being the first vendor to adopt a comprehensive provider/subscriber approach to VPNs. VPNWorX conforms to industry standards, which are enhanced and extended with many application-enabling capabilities. VPNWorX embodies a full spectrum of VPN-capable products that offer built-in convergence investment protection. And VPNWorX enjoys proven industry-leading performance in the world's largest VPN implementations, all of which are backed by global Direct-Touch NetCare services. VPNWorX is simply the most comprehensive VPN solution available, giving service provider and enterprise customers alike the very best in state-of-the-art capabilities.

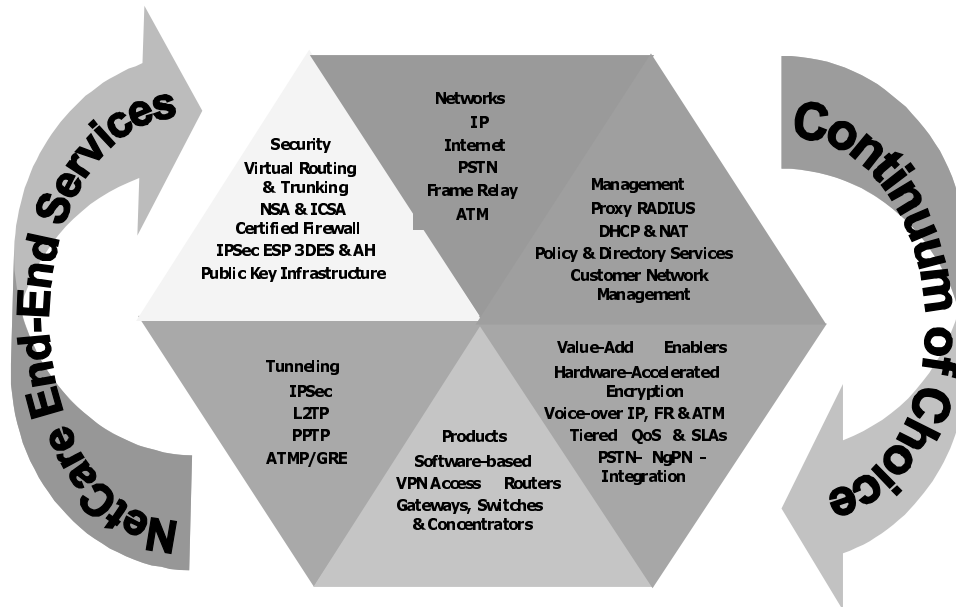


Figure 4 – VPNWorX has both the breadth and depth to meet today's demanding business needs.

Lucent's VPNWorX strategy fulfills the promise of VPNs by making "the network of the future" a reality today for enterprise-wide networking. Only Lucent offers the breadth and depth of solutions necessary to meet today's demanding *business* needs—because networking is all about *business solutions*, not technology. VPNWorX from Lucent. It's more than a strategy; it's a whole new way of doing business.